Impact of Herder Activities on Rangelands at Semi-Arid Zone of North Darfur State, Sudan

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ABSTRACT

The research work was conducted over a two years' period of 2015 and 2016 at three sites of Alfashir locality (Ummarahik 25km north of Alfashir, Fashar in eastern part of Alfashir about 5km and Berka 30km west of Alfashir), Western Sudan in semi-arid zone. The objectives were to assess the effect of human activities and animal grazing on rangelands, specific objectives were to assess grazing intensity and tree/shrub in the study area. In the first season the results showed that the higher number of quadrates subjected to grazing were at level (II) with the percentage of 55.56% for Ummarahik, and percent of 44.44% and 38.89% at level (I) grazing for Berka and Fashar. In Berka there was 5.56% for no grazing, and 16.67% in Fashar. Also the result showed there was 16.67% at level (IV) in Berka and Ummarahik and 11.11% in Fashar. In the second season the result showed that the percent of no grazing were 22.22% and 16.76% in Berka and Fashar respectively, also the result showed there was no grazing at level (IV) in Berka and Ummarahik. Berka had highest tree/shrub density which scored 32 and 23 tree/ha at season 2015 and 2016 respectively. Fashar scored lowest density 7 and 5 tree/ha.Balaniteaegyptiaca was the dominant tree species in the study area, while other species were less. The study concluded that unwise utilization and exploitation of the rangelands particularly by man causes range deterioration and serious reduction in range production, so, the study suggested that improvement and rehabilitation should be done. Further research work is needed to assess rangelands at different ecological zones in North Darfur State.

KEYWORDS: Grazing intensity, Grazing level, Tree/shrub density

INTRODUCTION:

The multiple values of rangeland include forage for domestic and wild animals, water, wood fuels, and wildlife cover. There are many competing uses for rangelands - uses that are increasing with population growth, increasing urbanization and interests in preservation [1]. Rangeland vegetation may be naturally stable or temporarily derived from other types of vegetation, especially following fire, timber harvest, brush clearing, or abandonment from cultivation [1] and it managed, typically, for livestock production[2]. Pastoral and agro-pastoral systems are the mainstay of the economy of North Darfur State. Livestock and its products are the primary source of income for over 60% of the population. North Darfur State is unique in its natural rangelands; being homeland for many nomadic tribes, capable of sustaining all kinds of livestock; and many livestock routes crossing the area. The balance between animals and feed does not exist in North Darfur State for the time being, and the number of animals is by far exceeding what the land is offering. Therefore, with the prevailing systems of production, the negative impact on the land and the environment would be expected to continue. These constraints may be reflected in severe deterioration in both quality and quantity of rangelands and consequently reduce livestock productivity.

MATERIALS AND METHODS

This study was carried out at Alfashir locality, North Darfur State, Sudan. The state lies between latitudes 12° 30' and21° 55' *N* and longitudes 24° 00' and27° 30' *E* within the arid and semi-arid zones. Average annual rainfall about 287.7 and 252.5 for the seasons 2015 and 2016 respectively. The study was done at three sites: Ummarahik, Fashar and Berka. Three transect lines of 2 km length were selected randomly in each site. In each transect three points were taken with 500m apart. In each point 2 quadrates (1m²) were taken with 50 m apart, so the total number of quadrates in the area was 54. For quadrates size, (1 m²)was usedas reported by[3].In each quadrate the degree of grazing intensity was determined using method similar to what was used by [4]. It was assessed as level I if it estimated <50%, level II if it is >50% and <75%, level III if >75% and <100% and level IV if it reached 100%grazing.

To determine tree/shrub density, Point Centered Quarter (PCQ) Method was used, three points located along each transect. The area around each point was divided into four 90° quarters of the compass, and the nearest tree/shrub in each quarter was sought. Each tree/shrub was identified, and its distance from the point was measured. Average distance for all trees/shrubs taken together was computed, and converted to total density by the formula given below[5],

Density per hectare = $1000/(D)^2$
D = average distance, in meter

Information used in the attainment of this study included both primary and secondary data. Primary data of vegetation measurements were collected from rangeland through intensive field surveys, and secondary data was obtained through various standard published and unpublished literatures. Measurement tools used include the following: Measuring tape (100-meter), recording sheet and quadrate (1mx1m).The statistical package for social science (SPSS, V 16) software program was used to separate between means.

RESULT AND DISCUSSION
Grazing intensity
Table No. 1 show the higher number of quadrates subjected to grazing was at level (II) grazing for Ummarahik and level (I) grazing for Berka and Fashar in the season (2015). There were no grazing quadrates recorded in Berka and Fashar, this may due to low nutritive value of plants. Also table No. 1 showed there were some quadrates subjected to grazing at level (IV); this may be attributed to more desirable plants at the study area, these plants were selected by animals or removed by human activities, another reason most of the livestock owners preferred to stay near to the security areas which is found around Alfashir town, this situation will result in excessive grazing which can lead to negative impact on rangelands. [6] stated that livestock grazing and displaced people activities can be considered as first factors affecting the study area.

The result in table No. 2 showed there was no grazing at level (IV) in Berka and Ummarahik; this result may be due to decrease number of animals or the system of animal grazing selection in diet. The structure of plant communities is often changed by grazing since a number of examples where defoliation by grazing herbivores altered plant height and canopy cover, and changed species composition to include structurally different types of plants. Trampling may also change the structure of plant communities by breaking and beating down vegetation. This agreed with [7]. The forces and influences discussed above make grazing a valuable vegetation management tool, while the misuse of domestic livestock grazing can increase populations of invasive plants. Proper grazing management can promote desirable vegetation and reduce invasive plant populations.

Table No. 1: "Grazing levels at different sites of the study in season 2015"

	Number of quadrates								
	No grazing		Level I		Level II		Level III		Level IV	
Berka	1	5.56%	7	38.89%	2	11.11%	5	27.77%	3	16.67%
Fashshar	3	16.67%	8	44.44%	4	22.22%	1	5.56%	2	11.11%
Ummarahik	0	0%	5	27.77%	10	55.56%	0	0%	3	16.67%

Level I (<50% grazed), Level II (>50 %< 75% grazed), Level III (>75 %< 100 grazed), Level IV (100% grazed).

Table No. 2: "Grazing levels at different sites of the study in season 2016"

	Number of quadrates								
	No grazing		Level I		Level II		Level III		Level IV	
Berka	4	22.22%	7	38.89%	5	27.78%	2	11.11%	0	0%
Fashshar	3	16.67%	4	22.22%	8	44.44%	1	5.56%	2	11.11%
Ummarahik	0	0%	5	27.77%	10	55.56%	3	16.67%	0	0%

Level I (<50% grazed), Level II (>50 %< 75% grazed), Level III (>75 %< 100 grazed), Level IV (100% grazed).

Tree and shrub density
Density is a measure of the number of trees and shrubs in a particular stand, Table No. 3 showed the average density of trees and shrubs in the study area. Berka had highest tree/shrub density; this may be due to the long distance of this area from IDPs who is settled at Alfashir town, this agreed with [8]. Fashar scored lowest density, this may attribute to the displacement activities; [6] stated that the range and farms around Alfashir town is less in trees or low, and that due to influence of displacement activities. Tables No. (4 and 5) indicate that *Balaniteaegyptiaca* was the dominant tree species in the study area, while other species were less. This was because some of these tree species are preferred by animals in the study area which produces leaves during the dry season and was subjected to intensive browsing. Some species was influenced by intensive cutting for building purposes, shaking off from some trees for animals and fire wood. Human activities involving clearing or destruction of the area of natural vegetation also have the potential to influence the distribution of tree cover. [9] mentioned the human activities and the natural variability of rainfall and climate change as the main causes of degradation.The removal of economically important trees and shrubs by people, usually for wood fuel and construction of houses is regarded as the first type of vegetation degradation and as the main factors responsible for the decrease and /or the disappearance of woody[10]. Heavy browsing can also affect woody species density;it affects populations of trees and shrubs negatively through increased mortality and decreased reproduction and recruitment [11].

Table No. 3: "Average tree/shrub density in the study area for season 2015 and 2016"

Site	2012	2013
Berka	32	23
Fashar	7	5
Ummarahik	15	10

Table No. 4: "The species density (tree or shrub/ha) in the study area at season 2015"

Species	Berka	Fashar	Ummarahik
Balanitesaegyptiaca	9	1	6
Acacia tortilis	6	1	3
Calotrophisprocera	7	3	0
Capparis decidua	3	2	0
Bosciasenegalensis	4	0	0
Fedherbiaalbida	3	0	0
Leptadeniapyrotechnica	0	0	3
Zizuphusspina-cristi	0	0	2
Maeruacrassifolia	0	0	1
Total	32	7	15

Table No. 5: "The species density (tree or shrub/ha) in the study area at season 2016"

Species	Berka	Fashar	Ummarahik
Balanitesaegyptiaca	6	0	4
Acacia tortilis	3	0	1
Calotrophisprocera	7	3	0
Capparis decidua	3	2	0
Bosciasenegalensis	4	0	0
Leptadeniapyrotechnica	0	0	3
Zizuphusspina-cristi	0	0	1
Maeruacrassifolia	0	0	1
Total	23	5	10

Photo No. 1: Effect of human activities on trees in the study area

Photo No. 2: Cutting trees for charcoal as source of income generation

CONCLUSION AND RECOMMENDATION

The rangelands in the study area are subjected to overuse and depletion of vegetation cover, especially around Alfashir town, due to increase in human population, animal numbers and change in environmental conditions. Continuous removing of trees and overgrazing expose the rangeland to wind erosion, disappearance of the palatable species given chance to unpalatable species to establish themselves and occupy the area. One of the most important techniques in rangeland management is proper time of grazing. Avoidance of early grazing when plants are most vulnerable at germination stage and before seeds setting stage is urgent because the different species in the different sites have different responsibility to grazing intensities.

National government should give special attention to the Forest National Corporation to put into practice its activities such as nursery establishment, seed distribution, forest reservation, protection, seedling production and distribution all over the deteriorated areas especially at the study area in order to recover the areas which were depleted and eroded by intensive misuse.

REFERENCES

[1] Heady HF, Child D. Rangeland Ecology and Management. West view Press, San Francisco, CA.1994

[2] Holechek, JL, RD Pieper, CH Herbal. Range management principles and practices. (5thed). Pearson Education. Inc. upper Saddle River, New Jersey2004.

[3] Lee P, Hanus S. Monitoring of Terrestrial Vascular Plants and Structure in the Forested Regions of Alberta: Background, Indicators, and Protocols. Chapter 13. Alberta Research Council. 83, 1999

[4] Saltaz D, H Schmidt, M Brown, A Karneili, D Ward, I Schmidt. Assessing grazing impacts by remote sensing in hyper-arid environments. J. Range management 52: 500-507 September 1999

[5] Cotton G, JT Curtis. The use of distance measure in Phyto-Sociological coupling. Ecology 37:451-460.1956

[6] Rahma AAE. The Impact of Displacement on Vegetation Cover Around IDP Camps in Alfashir Locality- North Darfur State- Sudan. M.Sc. Thesis, Alfashir University, College of Graduate Studies, Sudan. 2015, Unpublished.

[7] Huntly N.Herbivores and the dynamics of communities and ecosystems. Annual Review of Ecology and Systematics 22:477-503. 1991

[8] Adam AI. Study on Impact of Darfur Armed Conflict on Vegetation cover, Case study: Umkaddada Locality North Darfur State –Sudan, PhD thesis, Sudan University of Science & Technology, College of Graduate Studies.2013, Unpublished.

[9] Mohamed MAM, Elhag FMA, Elnour IA. Rangelands vegetation under different management systems and growth stages in north darfur state, sudan (range attributes), International journal of environment vol-3, Issue-3, Jun-Aug 2014, p332-343

[10] Macharia1 PN,Ekaya, WN. The Impact of Rangeland Condition and Trend to the Grazing Resources of a Semi-Arid Environment in Kenya. J. Hum. Ecol., 17(2): 143-147.2005

[11] Young TP, Augustine DJ. Interspecific Variation in the Reproductive Response of Acacia Species to Protection from Large Mammalian Herbivores. Biotropica 39(4):559–561.2007